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Four hundred and sixty-eighth meeting.

August 9, 1859. — STATED MEETING.

The PRESIDENT in the chair.

The Corresponding Secretary read letters of acceptance from the Hon. John H. Clifford and the Hon. Emory Washburn, who were elected Fellows at the preceding meeting. Also letters relative to the exchanges of the Academy.

Dr. C. T. Jackson communicated the results of the examination, made by Mr. John H. Blake and himself, of the Frozen Well in Brandon, Vermont; which was examined by them on the 10th and 11th of June last, in behalf of the Boston Society of Natural History.

This well is situated about half a mile west of the Brandon Hotel, and is on the estate of Abraham Trombley. It was dug in the month of November, 1858.

After sinking through loam and sandy sub-soil twenty feet, a bed of frozen gravel, with lumps of ice, was met with, and the whole bed was frozen to the thickness of about fifteen feet. The gravel consisted of large and small pebbles, imbedded in mud, which was all frozen. Some lumps of ice, of the size of twelve-pound cannon-balls, were taken out. Below this frozen deposit, sand was struck at the depth of thirty-five feet from the surface, and three springs of water came in from below, and still supply water.

The well is regularly walled with stones, and has a cover of marble, with a circular hole eighteen inches in diameter cut through it. Over the well there is a curb with a windlass, covered with a roof to keep the rain from the rope; this covering prevents any direct radiation of heat from the surface of the water in the well. At the bottom of the well, for five feet above the water, a crust of solid ice exists, attached to the walls of the well. In the winter and early summer the surface of the water freezes over, even as late as the month of June. On measuring the depth of the well, it was found to be 35.4 feet deep, and there were 2.4 feet of water in it. The temperature of the water on the 10th and 11th of June last was $\frac{1}{2}°$ Centigrade, or 33° F., while there was a thick crust of solid ice extending to the height of five feet above the water, and closely attached to the sides of the well. A boy was sent down in the bucket, and he broke off masses of this ice with a hammer, and sent it up for us to examine.

Since ice daily forms on the sides of the well, it is evident that the temperature of the gravel-bed must be considerably below the freezing point. The liquid water which supplies the well comes from the sandy stratum below, and is warmer than the stratum which overlies it.

A lighted candle was lowered down into the well, and it continued to burn; the flame was not in any manner deflected; so there was no current of air in the well. Numerous springs and wells in every direction around the frozen well were examined, and none of them were frozen, or were remarkable for coldness of their waters.

It was thus ascertained that the frozen stratum in which Trombley's well was sunk is quite limited, and that it is confined to the gravel-bed, or to the mass of frozen drift-pebbles, which shows itself on the road-side at the Hogback, four hundred and fifty feet northwest from the well. This gravel-bed dips directly towards the frozen well, and undoubtedly is the same stratum that was dug through in sinking it.

On examining this out-crop, we saw six feet in thickness of coarse pebbles, consisting of water-worn boulders and smooth pebbles of quartz, sienite, and blue limestone. Above this was about one foot in thickness of sand, and over that about two feet of mixed sand and clay, and above this the usual sandy loam of the country. The hill rises forty-five feet from the level of the top of the well, and the land slopes towards it at an angle of six degrees, the distance being four hundred and fifty feet. Northwest from this hill, and all around it, the rocks are blue-gray compact limestone, probably of Silurian age, but destitute of fossils. On the surface of these limestone rocks are abundant drift boulders, consisting of rocks that do not occur in place in that part of Vermont. They are drift-boulders from the north. The surface of the limestone ledges is much worn by drift action, presenting the well-known appearance of *les roches moutonée* of glacial regions.

It may be premature to propose any theory to account for the facts here stated, since we intend to make more extended researches, and through the liberality of a gentleman of this city (Uriah Boyden, Esq.) we are provided with the pecüniary means. It is proposed to sink another well to the gravel-bed, at a point half-way between the out-crop at the Hogback and the present well, in order to discover the extent of the frozen ground; and this we shall do now at the close of the summer months, when the heat shall have penetrated as far as it is likely to go.

Several hypotheses have been proposed, to account for the existence of this bed of frozen gravel; such as its being, perhaps, a fossil glacier of a period of intense cold, during the drift epoch; or that the cold air of the winter months may have penetrated through even a pebble-bed; or that the longer continuance of winter cold may have caused freezing of the gravel-bed, and that the heat of our short summers has not been able to reach the ice to melt it.

The committee as yet adopt no conclusions, but are collecting the elements for a solution of the problem, and hope in due time to arrive at trustworthy results. They have procured from Mr. David Buckland, of Brandon, (one of the Smithsonian observers,) a series of thermometrical tables of observations, extending from 1853 to 1859, which will enable them to estimate the temperature of the climate for each month of those years, and the mean annual temperature.

Professor Henry, of the Smithsonian Institution, made a verbal communication relative to the application of the telegraph to the prediction of changes of the weather, particularly in the city of Boston and its vicinity.

It has been fully established by the observations which have been made under the direction of the Smithsonian Institution, and from other sources of information, that the principal disturbances of the atmosphere are not of a local character, but commence in certain regions, and are propagated in definite directions over the whole surface of the United States east of the Rocky Mountains.

From a careful study of all the phenomena of the winds of the temperate zones, it is inferred that over the whole surface of the United States and Canada there are two great currents of air continually flowing eastward. These currents consist of an upper and a lower, the former returning the air to the south which was carried by the latter towards the north. The lower current, which is continually flowing over the surface of the United States, is about two miles in depth, and moves from the southwest to northeast. The upper or return current, which is probably of nearly equal magnitude, flows from northwest to southeast, or nearly at right angles to the other, and the resultant of the two is a current almost directly from the west. The reaction of these two currents appears to be the principal cause of the sudden changes of weather in our latitude. They give definite direction to our storms, accordingly as the latter are more influenced by the motion of the one or the other of these great aerial streams. The principal American storms may, from our present knowledge, be divided into two classes; namely, those which have their origin in the Caribbean Sea, and those which enter our territory from the north, at the eastern base of the Rocky Mountains. Those of the first class, which have been studied with much success by the lamented Redfield and others, follow the general direction of the Gulf-Stream, and, overlapping the eastern portion of the United States, give rise to those violent commotions of the atmosphere which are in many instances so destructive to life and property along our eastern coast. These storms from the south are frequently two or three days in traversing the distance from Key West to Cape Race, and their approach and progress might generally be announced by telegraph in time to guard against their disastrous effects. Though the general direction of these storms appears to be made out with considerable certainty, much remains to be done in settling the theory of their character and formation.

The materials which have been collected at the Smithsonian Institution during the last seven years, relative to the other class of storms, have enabled us to establish general facts of much value, not only in a scientific point of view, but also in their application to the prediction of the weather. [This statement was verified by a series of maps, exhibited to the Academy by Professor Henry, on which were indicated the beginning and progress of some remarkable changes of weather.] From these maps it appears that the great disturbances of the atmosphere which spread over the surface of the United States enter our territory from the possessions of the Northwest Company, about the sources of the Saskatchawan, at the base of the Rocky Mountains, and are thence propagated south and east, until, in many instances, they spread over the whole of the United States, and probably a large portion of the British possessions.

For example, the great depression of temperature which occurred in January of the present year, and which will be remembered by every one as the most marked cold period of the season, entered the territory of the United States at the point before mentioned on the 5th of January, and on the 6th reached Utah, on the 7th Santa Fé, and on the 8th the Gulf of Mexico, and, passing onwards, it was felt in Guatemala on the 10th. While it was advancing southward, it was spreading over the continent to the east; on the 7th, it reached the Red River settlement, and all places under the same meridian, down to the Gulf of Mexico. It reached the meridian of Chicago on the 8th, the western part of the State of New York on the 9th, New England on the 10th, and Cape Race on the 13th. It moved with about equal velocity over the Southern States, and was observed at Bermuda on the 12th.

The remarkable frost of last June, so far as it has been traced, had the same origin, and followed the same eastward course. The fact was also illustrated by the maps before mentioned, that the warm periods which have occurred in past years have followed the same law of progression, and consequently their approach could have been announced to the inhabitants of the Eastern States several days in advance, had a proper system of telegraphic despatches been established.

The value of the telegraph in regard to meteorology has been fully proved by the experience of the Smithsonian Institution. The Morse line of telegraph has kindly furnished the Institution during the last twelve months, free of cost, with a series of daily records of the weather, from the principal stations over the whole country east of the Mississippi River and south of New York. In order to exhibit at one view the state of the weather over the portion of the United States just mentioned, a large map is pasted on a wooden surface, into which, at each station of observation, a pin is inserted, to which a card can be temporarily attached. The observations are made at about seven o'clock in the morning, and as soon as the results are received at the Institution, an assistant attaches a card to each place from which intelligence has been obtained, indicating the kind of weather at the time; — rain being indicated by a black card, cloudiness by a brown one, snow by a blue one, and clear sky by a white card.

This meteorological map is an object of great interest to the many persons from a distance who visit the Institution daily; all appear to be specially interested in knowing the condition of weather to which their friends at home are subjected at the time. But the value of the map is not confined to the gratification of this desire. It enables us to study the progress of storms, and to predict what changes in the weather may be expected at the east, from the indications furnished by places farther west. For example, if a black card is seen in the morning on the station at Cincinnati, indicating rain at that city, a rain-storm may confidently be expected at Washington at about seven o'clock in the evening. Indeed, so uniformly has this prediction been verified, that last winter the advertising in the afternoon papers of the lectures to be delivered at the Institution that evening was governed by the condition of the weather in the morning at Cincinnati, — a rainy morning at the latter inducing a postponement of the lecture.

It must be evident, from the facts given, that if a system of telegraphing over the whole country east of the Rocky Mountains were established, information could be given to the Middle and Eastern States of the approach of disturbances of the atmosphere of much value to the agriculturist, the ship-owner, and to all others who transact business affected by changes of weather, as well as of importance to the invalid and the traveller. Indeed, with a proper combination of the lines now in operation, daily intelligence might be obtained in the city of Boston which would be of the highest interest to its inhabitants. Professor Henry mentioned Boston in particular, because this city is so situated that the storms, both of the southern and western class, reach it after they have been felt in New York, and in other places which are not as far east and north. It is necessary to remark, that the same use of the telegraph is in a measure inapplicable to the inhabitants of Western Europe, since they live on the eastern side of an ocean, and cannot be apprised of the approach of storms from the west. For the same reason, the general laws of storms are more conveniently studied by the meteorologists of this country than by those of Great Britain and France.

It should be distinctly understood, that the remarks which have been made in this communication relate to the more violent changes of the weather which occur in autumn, winter, and spring. The thunder-showers which occur almost daily during the warm weather in summer have somewhat of a local character, and commence at the same time, and frequently at the same hour, for several days in succession, at the same and different places; but wherever they commence, they move eastward over the country until they are exhausted.

Professor Henry also spoke of the facts collected in regard to the nature of American storms, and their connection with the two great aerial currents continually flowing over the temperate zone. He considered that the great changes of the weather are principally due to the gradual production of an unstable equilibrium in the two currents, by the accumulation of heat and moisture in the lower.

He spoke in high terms of the importance of the labors of Mr. Espy in developing the theory of the upward motion of air, and the evolution of latent heat in the production of storms.

In reply to a question as to the possibility of crossing the Atlantic in a balloon, the Professor stated that he had little doubt, if the balloon could be made to retain the gas, and to ascend into the upper current, it would be wafted across the ocean in the course of three or four days. If it descended into the lower current, it would be carried to the north of east; and if it continued in the upper current, it would reach Europe south of the same point. The course could be changed, within certain limits, by ascending and descending from one current to the other. The late balloon voyage from St. Louis to Jefferson County, New York, was of interest in confirming the theoretical direction of the great lower current of this latitude.

The Corresponding Secretary presented the following paper upon the Mosses collected in Captain Rodgers's recent exploring voyage; which is published by permission of Captain Rodgers.

Characters of some new Musci collected by Charles Wright in the North Pacific Exploring Expedition, under the Command*

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* Of the very interesting collection of Mosses brought home by the Expedition, eighty-six were gathered in Japan and adjacent islands, and seven on the coast of China. Of these ninety-three species, the fifty-four following are identical with species occurring either in Europe or in North America, or in both countries: —

Sphagnum squarrosum, Phascum crispum, Weisia viridula, Rhabloweisia fugax, Dicranella curvata, Dicranum scoparium, Trematodon longicollis, Leucobryum glaucum, Trichostomum pallidum, T. inflexum, Barbula unguiculata, Ceratodon purpureus, Eustichium Norvegicum, Orthotrichum fastigiatum, Hedwigia ciliata, Entosthodon acuminatum, E. ericetorum, Bryum pyriforme, B. nutans, B. torquescens, B. pallescens, Mnium punctatum, Bartramia pomiformis, B. fontana ? Atrichum angustatum, Pogonatum aloides, P. alpinum, Polytrichum juniperinum, P. commune, Hypnum scitum, H. minutulum, H. Starkii, H. crassinervium, H. popu-

of Captain John Rodgers. By WILLIAM S. SULLIVANT and LEO LESQUEREUX. August, 1859.

1. FISSIDENS LAXUS (sp. nov.): dioicus, perpusillus, acrocarpus, simplex; foliis 5 – 6-jugis oblongis longius acuminatis costa excurrente cuspidatis laxe areolatis, areolis hexagono-rotundis permagnis; capsula ovali leptodermi.

Hong Kong, China.

2. FISSIDENS INCRASSATUS (sp. nov.): dioicus, pusillus, acrocarpus, ramosus; foliis 8 – 10-jugis oblongis lineari-oblongisve subito acuminatis dense minute areolatis, costa vix excurrente; capsula ovali-oblonga pachydermi; operculo longe rostrato; calyptra dimidiata.

On rocks at Camoens' Grotto, near Macao; also at Hong Kong, China.

3. FISSIDENS PUNGENS (sp. nov.): monoicus, acrocarpus, pusillus, simplex; foliis 10 – 14-jugis anguste linearibus sensim acuminatis, costa sub apice desinente; capsula ovali rostrato-operculata; calyptra anguste conica; floribus masculis axillaribus.

On rocks in shaded ravines, Hong Kong, China.

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leum, H. salebrosum, H. velutinum, H. rutabulum, H. serpens var., H. adnatum, H. denticulatum, H. serrulatum, H. microcarpum, H. brevirostre, H. triquetrum, H. splendens, H. Oakesii, H. pratense, H. Haldanianum, H. cupressiforme var., H. polymorphum, H. cuspidatum, Hookeria lucens var.? Anomodon tristis, Pylaisæa velutina.

These species are distributed as follows: — eight occur only in Eastern North America, and six in Europe; two occur in Europe, and in Western North America; seven in Europe and in Eastern and Western North America; and thirty-one are common to both Europe and Eastern North America. Or, in other words, forty are found both in Europe and in North America; of the remaining fourteen, six are restricted to Europe, and eight to North America.

Closely allied to these fifty-four species are the twenty-four Japanese and Chinese species here characterized as new.

From these data it is apparent that the similarity of the bryology of Japan to that of Europe and North America, particularly their Western and Eastern portions respectively, is even greater than that which prevails (as recently shown by Professor Gray's admirable papers on the subject) in the Phænogamous floras of those countries; and indeed, excluding a *Hypopterygium* and a few *Macromitria*, — the latter represented by one species on the Southern Alleghany Mountains, — if all the species of the Japan collection should be found in New England, it would excite no other surprise than that they had so long escaped detection.

4. Orthotrichum Japonicum (sp. nov.): monoicum, laxe pulvinatum; foliis e basi elongato-lanceolata linearibus; capsula exserta obovata longicolla 8-striata; peristomii duplicis dentibus bigeminatis, ciliis nodoso-articulatis carinatis; calyptra campanulata multoties plicata epilosa.

On trees in shaded ravines, Hakodadi, Japan.

5. Dicranella obscura (sp. nov.): dioica, dense cæspitosa, subsimplex; foliis e basi lanceolata longissime subulatis subsecundis apice dentatis, costa percurrente; capsula ovali-cylindracea microstoma pachydermi; operculo aciculari-rostrato erecto; annulo obscuro; calyptra magna; sporis majusculis.

On steep banks near Hong Kong, China.

6. Ptychomitrium Wilsoni (sp. nov.): monoicum, cæspitosum; caulibus robustis; foliis confertis lineari-lanceolatis superne margine incrassata serratis, costa sub apice evanida; capsula elongato-ovali microstoma; operculo rectirostro; perist. dentibus subtrifidis hic illic pertusis; calyptra permagna campanulata rostrata plicata basi lobata.

On rocks and hill-sides, Simoda, Japan.

7. Trichostomum tortuloides (sp. nov.): monoicum, dense cæspitans; caulibus brevibus congesto-foliosis; foliis lineari-lanceolatis costa excurrente cuspidatis, marginibus incurvis subundulatis integerrimis; capsula cylindracea curvula; perist. dentibus modice contortis inferne nodoso-articulatis; operculo longe rostrato; calyptra longa angusta contorta.

On rocks among hills, near Simon's Town, Cape of Good Hope.

8. Mnium flagellare (sp. nov.): dioicum; caulibus simplicibus, innovationibus numerosis filiformibus erectis appresso-microphyllis infra perichæt. et perigon. oriundis; foliis caulinis ascendendo majoribus laxis erecto-patentibus oblongis elliptico-oblongisve superne duplicato-serratis dense minute rotundato-areolatis papillosis, costa percurrente; paraphysibus subclavatis: fructu non viso.

Rocks, on the summit of mountains, northeast of Hakodadi, Japan.

9. Leucobryum Boninense (sp. nov.): dioicum, subgracile; foliis lineari-lanceolatis strictiusculis superne convolutis apice serratis dorso lævibus, perichætialibus interioribus longe vaginantibus subito attenuatis; capsula obovato-oblonga strumosa; pedicello breviusculo: floribus masculis aggregatis.

Bonin Islands.

10. Macromitrium insularum (sp. nov.): dioicum, compacte cæspitans; ramis brevissimis densifoliis; foliis ligulatis acutis erecto-incurvis apice involutis, cellulis inferne lineari-oblongis subpellucidis superne rotundatis minutis carnosulis papillosis, costa cum apice desinente; capsula ovali microstoma brevipedicellata; operculo recte rostrato; calyptra mitriformi pilosissima.

On trees, Loo Choo Islands, Ousima; also Simoda, &c., Japan.

11. Macromitrium gymnostomum (sp. nov.): dioicum, tenellum, dense deplanato-cæspitans; ramis brevissimis incrassatis; foliis ligulatis acuminatis strictis erecto-patentibus inferne oblongo- superne minute rotundato-areolatis papillosis, costa sub apice evanida; capsula oblongo-ovali striata gymnostoma; operculo e basi depressa oblique aciculari-rostrato; calyptra cuculliformi plicata epilosa.

On rocks and trees, Simoda, Japan; and Ousima, one of the northern Loo Choo Islands.

12. Pogonatum Japonicum (sp. nov.): elatum; caule simplici sub perichætio innovante inferne aphyllo; foliis confertis siccitate circinato-tortilibus humidis patentissimis lineari-lanceolatis spinuloso-serratis brevius lamellosis; capsula cylindracea erecta subcurvula papillosa brevipedicellata.

Mountains northeast of Hakodadi, Japan.

13. Bryum humidulum (sp. nov.): dioicum, innovationibus gracilibus ramosum; foliis oblongo-lanceolatis sensim attenuatis costa excedente aristatis lineari-rhomboideo-areolatis superne denticulatis margine revolutis; capsula pendula elongata cylindraceo-clavata curvula late annulata; operculo magno hemisphærico papillato; peristomio normali.

Moist places among mountains, near Simon's Town, Cape of Good Hope.

14. Bryum crudoides (sp. nov.): dioicum; caule simplici; foliis ascendendo majoribus, inferioribus lanceolatis, comalibus erecto-patentibus lineari-lanceolatis acuminatis apice denticulatis areolatione lineari, costa valida evanida; capsula suberecta oblongo-elliptica brevicolla microstoma; peristomio *B. polymorphi:* flore masc. capituliformi.

Behring's Straits.

15. Bryum Wrightii (sp. nov.): monoicum vel synoicum, dense cæspitans, pusillum; caulibus ramisque perbrevibus; foliis gemmaceo-

imbricatis, comalibus lanceolatis longe acuminatis costa cuspidatis superne denticulatis laxius oblongo-areolatis marginibus anguste revolutis; capsula pendula globoso-pyriformi microstoma annulata; perist. intern. ciliis linearibus perforatis, ciliolis subnullis; operculo depresso-conico.

Arakamchetchene Island, Behring's Straits.

16. BRYUM MEGALODICTYON (sp. nov.): dioicum, pusillum; foliis erectis superne congestis oblongo-ovatis acutis concavis evanido-costatis, cellulis hexagono-oblongis amplissimis; capsula suberecta-oblongo-pyriformi annulata; ciliis perist. intern. linearibus ciliolis nullis; operculo hemisphærico-conico papillato.

"On walls at the Capitol," Loo Choo Islands.

17. BARTRAMIA INSERTA (sp. nov.): dioica, exigua, dense cæspitosa, luteo-viridis; foliis suberectis lineari-lanceolatis attenuatis sparse papillosis toto ambitu serratis marginibus recurvis, costa subpercurrente; capsula erecta globosa sulcata gymnostoma; operculo convexo minute conico.

On damp vertical rocks among hills, near Simon's Town, Cape of Good Hope.

18. HYPNUM ASSURGENS (sp. nov.): dioicum, homophyllum; caule arcuato-assurgente subpinnato-ramuloso eparaphylloso; foliis erecto-incurvis apertis e basi lata cordato-ovata lineari-lanceolatis papillosis apice serrulatis marginibus revolutis cellulis guttulatis opacis, costa pellucida sub apice evanida; capsula gibboso-oblonga cernua annulata; pedicello tuberculoso; operculo longirostrato; peristomio normali.

On decayed logs, shady hill-sides, Ousima, Loo Choo Islands.

19. HYPNUM DISPERSUM (sp. nov.): monoicum; caule prostrato diviso pinnato-ramuloso paraphylloso; foliis patentibus e basi late ovata subito lanceolato-attenuatis serrulatis papillosis, costa (præcipue in perichætialibus) valida sub apice evanida; capsula oblonga vel cylindracea curvula horizontali annulata; operculo convexo-conico obtuso.

On dry ground, shaded hill-sides, Simoda, Japan; and Loo Choo.

20. HYPNUM OBLONGIFOLIUM (sp. nov.): monoicum, prostratum, subpinnatum; caulibus ramisque laxius compresso-foliosis; foliis e basi brevissima convoluto-angustata oblongis acutis apice serratis lineari-areolatis; capsula (an normali?) gibboso-ovali inclinata; operculo convexo-conico apiculato; peristomio hypnoideo.

Hong Kong, China.

21. Hypnum Simodense (sp. nov.): dioicum, vage et subpinnatim ramosum; foliis confertis concavis ovato-ellipticis subito longe filiformi-acuminatis elongato-areolatis margine recurvis, costa supra medium evanescente; capsula oblongo-ovali subæquali plagiostoma erectiuscula; operculo conico brevirostro; peristomio *H. læti.*

Simoda, Japan.

22. Hypnum macrostegium (sp. nov.): dioicum; subfastigiato-ramosum; foliis confertis e basi oblongo-ovata sensim longe acuminatis plicato-striatis serratis elongato-areolatis margine basilari recurvis, costa subpercurrente; capsula cylindraceo-ovali erecta annulata; int. perist. ciliolis subnullis; operculo conico longe rostrato.

Steep banks, among hills, near Simoda, Japan.

23. Hypnum flaccidum (sp. nov.): monoicum, prostratum, subpinnatim ramosum, laxe foliosum; foliis subbifariis horizontalibus ovato-lanceolatis sensim filiformi-acuminatis ecostatis integerrimis laxissime oblongo-areolatis; capsula oblonga vix curvula longicolla horizontali; operculo breviconico obtusato.

On banks, shaded hill-sides, Simoda, Japan.

24. Hypnum spinulosum (sp. nov.): monoicum, irregulariter subpinnatimve ramosum, arctius deplanato-foliosum; foliis divergentibus ovato-lanceolatis setiformi-attenuatis ecostatis toto ambitu serratis densius elongato-areolatis; capsula obovato-oblonga basi attenuata curvula horizontali.

Simoda, Japan.

25. Hypnum thelidictyon (sp. nov.): monoicum, vage subfastigiato-ramosum; caulibus ramisque assurgentibus compressis; foliis laxis e basi constricta oblongis sensim longius acuminatis concavis ecostatis toto margine serratis, cellulis elongatis grosse unipapillatis, alaribus utrinque 3 – 4 amplissimis vesiculiformibus; capsula minuta in pedicello lævi oblonga subpendula; operculo longissime aciculari-rostrato.

Hill-sides, Ousima: rocks in ravines, Hong Kong, China.

26. Hypnum pohliæcarpum (sp. nov.): dioicum, prostratum, parce ramosum; foliis bifariam complanatis ovato-lanceolatis brevius recte vel oblique acuminatis apice grosse serratis, cellulis linearibus, costellis binis brevissimis; capsula cylindracea longicolla vix incurva subpendula; operculo conico brevirostrato.

On steep shaded banks, Simoda, Japan.

27. Hypnum erectiusculum (sp. nov.): dioicum, subprostratum; caule vage diviso ramuloso compresso; foliis deorsum falcatis late ovato-lanceolatis acuminatis apice serrulatis dense lineari-areolatis, costellis subnullis; capsula gracili cylindracea erectiuscula annulata; operculo conico obtuso.

Hakodadi, Japan.

28. Hypnum Rodgersianum (sp. nov.): dioicum, majusculum; caule assurgente simplici vel semel diviso regulariter pinnato-ramuloso; foliis oblongo-lanceolatis acuminatis deorsum falcatis serrulatis ecostatis tenui-areolatis; capsula oblonga breviuscula turgida gibboso-incurva, sicca estriata; operculo obtuse conico.

On the ground, shady mountain sides, Katonasima, between the proper Loo Choo group and Japan.

29. Hypnum eximium (sp. nov.): monoicum, exiguum, prostratum, pinnato-ramulosum; foliis laxis bifariis oblongis ovato-oblongisve acutis ecostatis superne serratis laxius elongato-areolatis; capsula gibboso-oblonga turgida incurva subhorizontali annulata; operculo convexo-conico.

On decayed wood, mountain-sides, Bonin Islands.

30. Hypnum subalbidum (sp. nov.): monoicum, exiguum, prostratum, vage subpinnatim ramulosum; foliis compressis divergentibus oblongo-lanceolatis tenuiter acuminatis integerrimis ecostatis lineari-areolatis; capsula subovali vix curvula horizontali exannulata; operculo conico brevirostrato.

On damp decayed wood, Simoda, Japan; also Bonin Islands.

31. Hypnum Smallii (sp. nov.): dioicum, exiguum; caule prostrato subpinnatim ramuloso; foliis subcompresse imbricatis erecto-patentibus lanceolatis longe acuminatis ecostatis obsolete serrulatis, cellulis compactis angustissimis; capsula elongato-elliptico-oblonga horizontali pendulave; operculo conico rostrato.

On decayed logs, shaded hill-sides, Ousima; also Bonin Islands.

32. Hypnum Ometepense (sp. nov.): monoicum, laxe cæspitosum; caule tenui repente; ramis arcuato-erectis fasciculato-ramulosis; foliis lanceolatis acuminatis patentibus superne serratis, cellulis linearibus, costellis binis brevissimis; capsula in pedicello elongato obovato-oblonga macrostoma subpendula; operculo e basi conica tenuiter brevi-rostrato.

On bushes, summit of a mountain on the Island of Ometepe, in Lake Nicaragua.

33. HOOKERIA WRIGHTII (sp. nov.): dioicum, majusculum, prostratum, dense pinnatim ramulosum, subcompresse foliosum; foliis oblongo-ovalibus subito in acumen longum tenue flexuosum productis, marginibus infra acumen convolutis, cellulis angustissime linearibus, costis binis ad medium evanidis; capsula oblonga inæquali macrostoma inclinata; peristomio normali eciliolato; operculo convexo-conico recte rostrato; calyptra e basi mitriformi multifida longe rostrata.

Growing with *Hypnum Ometepense.*

The following paper was also presented through the Corresponding Secretary.

A Synonymic List of the Echinodermata of the Palæozoic Rocks of North America. By S. S. LYON and S. A. CASSEDAY.

In devoting the leisure hours of the last few months to the study of the Crinoidea of Kentucky and other of the principal Western States, we found, at the very outset, that the principal difficulty attending such researches was the entire absence of any concise summary of the labors of American palæontologists among this interesting family of fossil remains. In order to supply this deficiency, the following synonymic list was formed for our private use; but, hoping it might aid others engaged in similar studies, it was determined to offer it for publication. It embraces only the Crinoidea of the Palæozoic Rocks; as our acquaintance with those of the newer systems is necessarily exceedingly limited, owing to their imperfect development in the States to which reference has been made above. Besides, the rocks above the Permian afford comparatively few species of these organisms.

It was at first intended to divide the subcarboniferous into upper and lower; but the imperfect knowledge of the stratigraphy of the Western rocks precludes the feasibility of such a division.

These labors have been retarded, and possibly left imperfect, on account of the few facilities within our reach. Unable to command an extensive collection of authorities, we have been forced to gather here and there, in private libraries, the required information.

Some of the species recognized in the table were evidently founded upon mere fragments, which, however interesting in themselves, are wholly insufficient for characterizing species. They are enumerated, however, in order that the table may be as complete as the materials within reach would allow.

List of Palæozoic Echinodermata of North America.

ACROCRINUS, Yandell, Sill. Jour., 1855, Vol. 20, p. 135.

A. SHUMARDI, Yandell, Sill. Jour., 1855, Vol. 20, p. 135, with woodcut. *Subcarboniferous.* Archimedes limestone.

A. URNÆFORMIS, Hall, Iowa, Vol. 1, p. 690, Pl. 25, fig. 9, a, b. *Subcarboniferous.* Kaskaskia limestone.

ACTINOCRINUS, Miller, 1821.

A. ABNORMIS, Lyon, Geol. Survey of Kentucky, Vol. 3, p. 479, Pl. 4, fig. 1, a, b. *Devonian.* Beargrass Creek, Kentucky.

A. ÆQUALIS, Hall, Iowa, Vol. 1, p. 592, Pl. 11, fig. 4, a, b. *Subcarboniferous.* Burlington limestone.

A. BITURBINATUS, Hall, Iowa, Vol. 1, p. 616, Pl. 16, fig. 5, 6, a, b, c. *Subcarboniferous.* Keokuk limestone.

A. BREVICORNIS, Hall, Iowa, Vol. 1, p. 571, Pl. 10, fig. 4, a, b. *Subcarboniferous.* Burlington limestone.

A. BREVIS, Hall, Iowa, Vol. 1, p. 567, Pl. 10, fig. 3, a, b. *Subcarboniferous.* Burlington limestone.

A. CÆLATUS, Hall, Iowa, Vol. 1, p. 585, Pl. 10, fig. 14, a, b. *Subcarboniferous.* Burlington limestone.

A. CHRYSTYI, Shumard, Geol. Survey of Missouri, Part 2, p. 191, Pl. A, fig. 3. *Subcarboniferous. Actinocrinites,* Chrysty, Letters on Geology, Pl. 1, fig. 1, 2. Encrinital limestone.

A. CONCINNUS, Shumard, Geol. Survey of Missouri, Part 2, p. 189, Pl. A, fig. 5. *Subcarboniferous.* Encrinital limestone.

A. CORNICULUS, Hall, Iowa, Vol. 1, p. 566, Pl. 10, fig. 1, a–c. *Subcarboniferous.* Burlington limestone.

A. CORNIGERUS, Hall, Iowa, Vol. 1, p. 576, Pl. 9, fig. 12, a–c. *Subcarboniferous.* Burlington limestone.

A. DISCOIDEUS, Hall, Iowa, Vol. 1, p. 594, non icon. *Subcarboniferous.* Burlington limestone.

A. (BATO) EIKOSIADACTYLUS, Casseday, Zeitschrift der Deutschen Geol. Gesell. Berlin, 1854, p. 238, Pl. 2, fig. 1, a–c, 3. *Subcarboniferous.* Spurgen Hill, Iowa, in the Archimedes limestone.

A. GOULDI, Hall, Iowa, Vol. 1, p. 613, Pl. 15, fig. 6, a, b. *Subcarboniferous.* Keokuk limestone.

A. (BATO) IRREGULARIS, Casseday, Zeitschrift der Deutschen Geol. Gesell., p. 240, Pl. 2, fig. 2, a – c. *Subcarboniferous.* Spurgen Hill, Iowa.

A. KONINCKI, Shumard, Geol. Survey of Missouri, Part 2, p. 194, Pl. A, fig. 8, a – c. *Subcarboniferous.* Encrinital limestone.

A. LONGIROSTRIS, Hall, Vol. 1, p. 589, Pl. 2, fig. 2, a, b, 4, c, d. *Subcarboniferous.* Burlington limestone.

A. LOWEI, Hall, Iowa, Vol. 1, p. 611, Pl. 15, fig. 5, a, b. *Subcarboniferous.* Keokuk limestone.

A. MINOR, Hall, Iowa, Vol. 1, p. 573, non icon. *Subcarboniferous.* Burlington limestone.

A. MISSOURIENSIS, B. F. Shumard, Geol. of Missouri, Part 2, p. 190, Pl. A, fig. 4, a – c. *Subcarboniferous.* Encrinital limestone.

A. MULTIRADIATUS, B. F. Shumard, Trans. Acad. Sci. St. Louis, 1857 – 8, Vol. 1, No. 1, p. 75, Pl. 1, fig. 5. *A. multiradiatus*, Hall, Iowa, Vol. 1, p. 579, Pl. 10, fig. 9. *Subcarboniferous.* Burlington limestone.

A. MULTIBRACHIATUS, Hall, Iowa, Vol. 1, p. 580, Pl. 10, fig. 10. *Subcarboniferous.* Burlington limestone.

A. (DORYCRINUS) MISSISSIPPIENSIS, Roemer, Archiv fur naturgeschichte, Von Troschel, Jahrgang XIX., Bd. 1, 1853. *Subcarboniferous.* His genus was based merely upon the remarkably long thorns which protrude from the upper surface.

A. NASHVILLIÆ, Hall, Iowa, Vol. 1, p. 609, Pl. 15, fig. 4; Pl. 16, fig. 4, a, b; Troost, Monograph, MSS. *Subcarboniferous.* Keokuk limestone; White's Creek, Tennessee.

A. ORNATUS, Hall, Iowa, Vol. 1, p. 583, Pl. 10, fig. 12. *Subcarboniferous.* Burlington limestone.

A. PARVUS, B. F. Shumard, Geol. Survey of Missouri, Part 2, p. 193, Pl. A, fig. 9. *Subcarboniferous.* St. Louis limestone.

A. PENTAGONUS, Hall, Iowa, Vol. 1, p. 579, Pl. 10, fig. 6, a, b. *Subcarboniferous.* Burlington limestone.

A. PERNODOSUS, Hall, Iowa, Vol. 1, pp. 608, 617, Pl. 15, fig. 3, a, b; Pl. 16, fig. 7. *Subcarboniferous.* An adult specimen of *A. verrucosus*, Hall.

A. PERNODOSUS, var., Hall, Iowa, Vol. 1, p. 617, Pl. 16, fig. 7. *Subcarboniferous.* Keokuk limestone.

A. PLUMOSUS. *Vide* Glyptocrinus plumosus.

A. PROBOSCIDALIS, Hall, Iowa, Vol. 1, p. 584, Pl. 10, fig. 13. *Subcarboniferous.* Burlington limestone.

A. PYRAMIDATUS, Hall, Iowa, Vol. 1, p. 565, non icon. *Subcarboniferous.* Burlington limestone.

A. PYRIFORMIS, B. F. Shumard, Geol. Survey of Missouri, Part 2, p. 192, Pl. A, fig. 6, a, b. *Subcarboniferous.* Encrinital limestone.

A. RAMULOSUS, Hall, Iowa, Vol. 1, p. 615, Pl. 15, fig. 7. *Subcarboniferous.* Keokuk limestone.

A. ROTUNDUS, Yandell and Shumard, Geol. Survey of Missouri, Part 2, p. 191, Pl. A, fig. 2, a, b. See Chrysty, Letters, Pl. 1, fig. 3, 4. *Subcarboniferous.* Encrinital limestone.

A. SCULPTUS, Hall, Iowa, Vol. 1, p. 582, Pl. 10, fig. 11, a, b. *Subcarboniferous.* Burlington limestone.

A. SUBACULEATUS, Hall, Iowa, Vol. 1, p. 570, Pl. 10, fig. 2, a, b. *Subcarboniferous.* Burlington limestone.

A. SUPERLATUS, Hall, Iowa, Vol. 1, p. 572, non icon. *Subcarboniferous.* Burlington limestone.

A. SYMMETRICUS, Hall, Iowa, Vol. 1, p. 574, Pl. 10, fig. 8, a, b. *Subcarboniferous.* Burlington limestone.

A. TENUIRADIATUS, Hall, Palæont. of New York, Vol. 1, p. 18, Pl. 4, fig. 8, 9. *Silurian.* This is *Palæocystites tenuiradiatus.*

A. TRICORNIS, Hall, Iowa, Vol. 1, p. 569, non icon. *Subcarboniferous.* Burlington limestone.

A. TRINODUS, Hall, Iowa, Vol. 1, p. 575, non icon. *Subcarboniferous.* Burlington limestone.

A. TURBINATUS, Hall, Iowa, Vol. 1, p. 587, Pl. 11, fig. 1. *Subcarboniferous.* Burlington limestone.

A. TURBINATUS, var. ELEGANS, p. 588, Pl. 11, fig. 5. *Subcarboniferous.* Burlington limestone.

A. UMBROSUS, Hall, Iowa, Vol. 1, p. 590, Pl. 11, fig. 3, a, b. *Subcarboniferous.* Burlington limestone.

A. UNICORNIS, Owen and Shumard, Geol. Survey of Wisconsin, Iowa, and Minnesota, 1852, p. 593, Pl. 5, A, fig. 12, a, b. *A. unicornis*, Hall, Iowa, p. 568. *Subcarboniferous.* Burlington limestone.

A. VENTRICOSUS, Hall, Iowa, Vol. 1, p. 595, Pl. 11, fig. 6, a, b. *Subcarboniferous.* Burlington limestone.

A. VERRUCOSUS, Hall, Iowa, Vol. 1, p. 578, Pl. 10, fig. 7, a, b. *Subcarboniferous*. Probably a younger specimen of *A. pernodosus*.

A. VERNEUILIANUS, B. F. Shumard, Geol. Survey of Missouri, Part 2, p. 193, Pl. A, fig. 1, a, b. *Subcarboniferous*. Encrinital limestone.

A. YANDELLI, B. F. Shumard, Trans. Acad. Sci. St. Louis, 1857, Vol. 1, No. 1, p. 76. *Actinocrinites*, Yandell and Shumard, Contributions, p. 24, fig. 5, a, b. *Subcarboniferous*. Button-Mould Knob, Kentucky.

AGARICOCRINITES, Troost, MSS. (Sub-genus of ACTINOCRINUS, Hall, 1858.)

A. BULLATUS, Hall, Iowa, Vol. 1, p. 562, Pl. 9, fig. 11, a, b. *Subcarboniferous*. Burlington limestone.

A. STELLATUS, Hall, Iowa, Vol. 1, p. 564. *Subcarboniferous*. Burlington limestone.

A. TUBEROSUS, Hall, Iowa, Vol. 1, p. 617, Pl. 16, fig. 2, a, b, c. *A. tuberosus*, Troost, MSS., Cat. *Amphoracrinus Americanus?* Rœmer, in Bronn, Lethea, Vol. 11, p. 50, Pl. 4, fig. 15, a, b. *Subcarboniferous*. Keokuk limestone; Warsaw limestone, White's Creek, Tennessee.

A. WHITFIELDI, Hall, Iowa, Vol. 1, p. 621. *Subcarboniferous*. Keokuk limestone.

A. WORTHENI, Hall, Iowa, Vol. 1, p. 619, Pl. 16, fig. 1. *Subcarboniferous*. Keokuk and Warsaw limestone.

AGASSIZOCRINUS, Troost, MSS.; Hall, 1858, Iowa, Vol. 1, p. 684.

A. CONICUS, Hall, Iowa, Vol. 1, p. 687. *Astylocrinus lævis*, F. Rœmer. See Owen and Shumard, Rep. Wisconsin, Iowa, and Missouri, p. 597, Pl. 5, fig. 6. *Subcarboniferous*. This fossil has a wide range: it extends from Iowa to Tennessee.

A. CONSTRICTUS, Hall, Iowa, Vol. 1, p. 687, Pl. 25, fig. 10. *Subcarboniferous*. Kaskaskia limestone.

A. DACTYLIFORMIS, Hall, Iowa, Vol. 1, p. 685; Troost, MSS.; Shumard, Red River of Louisiana, p. 199. *Subcarboniferous*. Kaskaskia limestone.

A. GIBBOSUS, Hall, Iowa, Vol. 1, p. 686, Pl. 25, fig. 6, and 6, b. *Subcarboniferous*. Kaskaskia limestone.

AGELACRINUS, Vanuxem, 1842.

A. DICKSONI, Billings, Geol. Survey of Canada, Palæont., Dec. III. p. 84, Pl. 8, fig. 3, 3 a, 4, 4 a. *Silurian.* Trenton limestone.

A. HAMILTONENSIS, Vanuxem, Geol. 3d Dist. New York, p. 306, 158. *Devonian.* Hamilton group.

A. KASKASKIENSIS, Hall, Iowa, Vol. 1, p. 696, Pl. 25, fig. 18. *Subcarboniferous.* Kaskaskia limestone.

AMYGDALOCYSTITES, Billings, 1854.

A. FLOREALIS, Billings, Canadian Journal, Vol. 2, p. 270 ; Survey Report, 1856, p. 289 ; Palæontology, Dec. III. p. 63, Pl. 6, fig. 1, a – e. *Silurian.* Trenton limestone.

A. TENUISTRIATUS, Rep. Geol. Survey of Canada, 1857, p. 289 ; Canad. Journ. Vol. 2, p. 271 ; Palæont., Dec. III. p. 64, Pl. 6, fig. 2 a, 2 b. *Silurian.* Lower Silurian.

A. RADIATUS, Rep. Geol. Survey of Canada, 1857, p. 289 ; Canad. Journ., Vol. 2, p. 271 ; Palæont., Dec. III. p. 65, Pl. 6, fig. 3, a, b. *Silurian.* Trenton limestone.

APIOCYSTITES, Forbes, 1848.

A. ELEGANS, Hall, Nat. Hist. of New York, Palæontology, Vol. 2, p. 243, Pl. 51, fig. 1 – 17. Compare *A. pentremoides*, Forbes, Mem. Geol. Soc. of Great Britain, 1848, Vol. 2, Part. 2, p. 502, Pl. 45. *Silurian.* Niagara group.

ARCHEOCIDARIS, McCoy. ECHINOCRINUS, Volborth, 1832. PALÆOCIDARIS, Desor.

A. ACULEATUS, Shumard, Trans. Acad. St. Louis, Vol. 1, No. 2, 1858, p. 223. Coal measures.

A. AGASSIZI, Hall, Iowa, Vol. 1, p. 698, Pl. 26, fig. 1, a – d. *Subcarboniferous.* Burlington limestone.

A. BIANGULATUS, Shumard, Trans. Acad. St. Louis, Vol. 1, Part 2, p. 224. Middle coal measures.

A. KEOKUKI, Hall, Iowa, Vol. 1, p. 699, Pl. 26, fig. 2, a, b. *Subcarboniferous.* Keokuk limestone.

A. MEGASTYLUS, Shumard, Trans. Acad. St. Louis, Vol. 1, Part 2, p. 225. Upper coal measures.

A. NORWOODI, Hall, Iowa, Vol. 1, p. 701, Pl. 26, fig. 5, a – e. *Subcarboniferous.* Kaskaskia limestone.

A. SHUMARDIANA, Hall, Iowa, Vol. 1, p. 699, Pl. 26, fig. 3, a – d, *Subcarboniferous.* Warsaw limestone.

A. VERMILIANA, King, Per. Foss., Pl. 6, figs. 22 – 24; Swallow and Hahn, Trans. Acad. Nat. Sci. St. Louis, Vol. 1, No. 2, p. 180. In the Permian rocks of Kansas.

A. WORTHENI, Hall, Iowa, Vol. 1, p. 700, Pl. 26, fig. 4, a – g. *Subcarboniferous.* St. Louis limestone.

ASTERIAS, Linnæus, 1748.

A. ANTIQUA, Troost, Trans. Geol. Soc. of Pennsylvania, Vol. 1, p. 232, Pl. 10, fig. 9; 5th Rep. Geol. Tennessee, p. 58: *non* Hist. Sueci, p. 89, t. 26, f. 6. *Silurian.* Mountain limestone.

A. ANTIQUATA, Prof. Locke, Proceed. Acad. Philad., Vol. 1, p. 32. *Silurian.* Cincinnati, Ohio.

A. MATUTINA, Hall, Palæont. N. York, Vol. 1, p. 91, Pl. 29, fig. 5, a, b. *Silurian.* Trenton limestone.

A. Sp. indet., Hall, Palæont. N. York, Vol. 1, p. 18, Pl. 4, fig. 11, a, b. *Silurian.* Chazy limestone.

A. Sp. indet., G. Graham, J. G. Anthony, and U. P. James, Sill. Jour., 2d Series, Vol. 1, p. 441, with wood-cut. *Silurian.* Cincinnati, Ohio.

ASTEROCRINUS. *Vide* Plerotocrinus.

ASTYLOCRINUS. *Vide* Agassizocrinus.

ASTROCRINITES, Conrad (non Austin).

A. PACHYDACTYLUS, Conrad, in Mather, Geol. New York, p. 346, 347; Sill. Jour., 1st Series, Vol. 27, p. 363. *Silurian.* Pentamerus limestone.

ATELEOCYSTITES, Billings, 1858, Geol. Survey of Canada, Palæont., Dec. III. p. 72. *Silurian.* Lower Silurian.

A. HUXLEYI, Billings, Palæont., Dec. III. p. 72. *Silurian.* Trenton limestone.

BATOCRINUS. *Vide* Actinocrinus.

CARYOCRINUS, Say, 1825, Jour. Acad. Nat. Sci. Phil., IV. 9.

C. ORNATUS, Hall, Palæont. New York, Vol. 2, Pl. A, 41, fig. 1, Pl. 49, fig. 1, a – z, Pl. 49 A, fig. 1, a – d. Von Buch, Uber Cystideon, Taf. 1, fig. 1 – 7. *Silurian.* Niagara Group.

CLOSTEROCRINUS, Hall, 1852.

C. ELONGATUS, Hall, Palæont. New York, Vol. 2, p. 179, Pl. A, 41, fig. 2, a – f. *Silurian.* Clinton Group.

CODASTER, McCoy.

C. ALTERNATUS, Lyon, Geol. Survey of Kentucky, Vol. 3, p. 493, Pl. 3, fig. 3, a, b. *Devonian.* Beargrass Creek, Ky.

C. AMERICANUS, Shumard, Trans. Acad. St. Louis, 1858, Vol. 1, No. 2, p. 239. *Devonian.* Falls of the Ohio.

C. KENTUCKIENSIS, Shumard, l. c. Pl. 9, fig. 5. *Subcarboniferous.* See Pentremites Kentuckiensis.

C. PYRAMIDATUS, Shumard, l. c. p. 238, Pl. 9, fig. 1, a – e. *Devonian.* Beargrass Creek and Falls of the Ohio.

COMAROCYSTITES, Billings, 1854, Geol. Survey of Canada, Palæont., Dec. III. p. 61. Canad. Journ. Vol. 2, p. 269. Geol. Survey Rep., 1856, p. 288.

C. PUNCTATUS, Billings, l. c. Pl. 5. *Silurian.* Trenton limestone.

CYATHOCRINUS, Miller, 1821.

C. BULLATUS, Hall, Iowa, Vol. 1, p. 624, Pl. 28, fig. 1, a. *Subcarboniferous.* Keokuk limestone.

C. CORNUTUS, Owen and Shumard, Geol. Survey of Wisconsin, Iowa, and Minnesota, p. 591, Pl. 5 A, fig. 8, a, b. *Subcarboniferous.* Burlington, Iowa.

C. DIVARICATUS, Hall, Iowa, Vol. 1, p. 554, Pl. 9, fig. 5. *Subcarboniferous.* Burlington limestone.

C. (?) FLOREALIS, Yandell and Shumard, Contributions, p. 24, Pl. 1, fig. 1. *Subcarboniferous.* Greyson Co., Kentucky.

C. GRAULIFERUS, Shumard, Red River, p. 199. *Subcarboniferous.*

C. INTERMEDIUS, Hall, Iowa, Vol. 1, p. 627, Pl. 28, fig. 10. *Subcarboniferous.* Keokuk limestone.

C. IOWENSIS, Owen and Shumard, Geol. Survey of Wisconsin, Iowa, and Minnesota, p. 591, Pl. 5 A, fig. 11, a – c. *Subcarboniferous.* Burlington, Iowa.

C. MAGISTER, Hall, Iowa, Vol. 1, p. 628, Pl. 28, fig. 2, a, b, 3, a, b. *Subcarboniferous.* Keokuk limestone.

C. MALVACEUS, Hall, Iowa, Vol. 1, p. 554, Pl. 9, fig. 4, a, b. *Subcarboniferous.* Burlington limestone.

C. (?) MANIFORMIS, Yandell and Shumard, Contributions, p. 25, fig. 2. *Subcarboniferous.* Greyson Co., Kentucky.

C. PENTALOBUS, Hall, Iowa, Vol. 1, p. 687, Pl. 25, fig. 5, a, b. *Subcarboniferous.* Kaskaskia limestone.

C. PROTUBERANS, Hall, Iowa, Vol. 1, p. 626, Pl. 28, fig. 9. *Subcarboniferous.* Keokuk limestone.

C. PYRIFORMIS, Sill. Journ., 1st Series, Vol. 48, p. 314. *Silurian.* Lockport, New York.

C. RAMOSUS, (?) King, Perm. Fossils, Pl. 6, fig. 15 – 21. Swallow and Hahn, Rocks of Kansas, 1858, in Trans. Acad. St. Louis, p. 186. Permian rocks of Kansas.

C. ROTUNDATUS, Hall, Iowa, Vol. 1, p. 555, Pl. 9, fig. 7, a, b. *Subcarboniferous.* Burlington limestone.

C. SPURIUS, Hall, Iowa, Vol. 1, p. 625, Pl. 28, fig. 78. *Subcarboniferous.* Keokuk limestone.

C. STELLATUS, Hall, l. c. p. 623, Pl. 16, fig. 3, 8. Troost, Monogr. and Proceedings. *Subcarboniferous.* Keokuk limestone.

C. TUMIDUS, Hall, Iowa, Vol. 1, p. 624, Pl. 18, fig. 1, b, c. *Subcarboniferous.* Keokuk limestone.

CYCLOCYSTOIDES, Billings and Salter, 1858. *Silurian.* From the lower and middle Silurian rocks of Canada.

C. DAVISI (Salter), Billings, Geol. Survey of Canada, Palæont., Dec. III. p. 89. *Silurian.*

C. HALLI, Billings and Salter, Geol. Survey of Canada, Palæont., Dec. III. p. 86. *Silurian.* Trenton limestone.

DENDROCRINUS, Hall, 1852.

D. LONGIDACTYLUS, Hall, Palæont. New York, Vol. 2, p. 193, Pl. 43, fig. 1, a – k; Pl. 42, fig. 7, a, b. *Silurian.* Niagara group.

DICHOCRINUS, Münster, 1839.

D. CORNIGERUS, Shumard, Trans. Acad. St. Louis, Vol. 1, No. 1, p. 72, Pl. 1, fig. 1, a – d. *Subcarboniferous.* Buzzard Roost, Alabama.

D. OVATUS, Owen and Shumard, Geol. Survey of Wisconsin, Iowa, and Minnesota, p. 590, Pl. 5 A, fig. 9, a, b. *Subcarboniferous.* Burlington, Iowa.

D. PROTUBERANS, Hall, Iowa, Vol. 1, p. 689, Pl. 25, fig. 7. *Subcarboniferous.* Kaskaskia limestone.

D. SEXLOBATUS, Shumard, Trans. Acad. St. Louis, 1857, Vol. 1, No. 1, p. 73, Pl. 1, fig. 3, a – c. *Subcarboniferous.* Archimedes limestone.

D. SIMPLEX, Shumard, l. c. p. 74, Pl. 1, fig. 2, a, b. Hall, Iowa, Vol. 1, p. 654, Pl. 22, fig. 12, a, b. *Subcarboniferous.* Archimedes limestone, Warsaw limestone.

D. STRIATUS, Owen and Shumard, Geol. Survey of Wisconsin, Iowa, and Minnesota, p. 590, Pl. 5 A, fig. 10, a, b. *Subcarboniferous.* Burlington, Iowa.

DOLATOCRINUS, Lyon, 1857.

D. LACUS, Lyon, Geol. Survey of Ken., Vol. 3, p. 482, Pl. 4, fig. 2, a – c. *Devonian.* Beargrass Creek; Falls of the Ohio.

DORYCRINUS. *Vide* Actinocrinus.

ECHINOENCRINITES, H. von Meyer, 1826.

E. ANATIFORMIS, Hall, Palæont. New York, Vol. 1, p. 89, Pl. 29, fig. 4, a – f. *Silurian.* Trenton limestone.

ECHINOSPHERITES, Wahlenberg, 1821.

E. ——— ? Hall, in Foster and Whitney's Rep. Superior, Part II. p. 208, Pl. 25, fig. 3, a, b. *Silurian.*

EDRIOASTER, Billings, 1858. CYCLASTER, Geol. Survey of Canada, Rep. 1856, p. 292.

E. BIGSBYI, Billings, Geol. Survey of Canada, Palæont., Dec. III. p. 82. *Cyclaster Bigsbyi,* Survey Rep. 1856, p. 293. *Silurian.* Trenton limestone.

ELÆCRINUS. *Vide* Nucleocrinus.

ELEUTHEROCRINUS, Yandell and Shumard, 1856.

E. CASSEDAYI, Yandell and Shumard, Proceed. Acad. Nat. Sci. Phil., Vol. 8, p. 74, Pl. 2, fig. 1 – 5. *Devonian.* Beargrass Creek, near Louisville, Kentucky.

EUCALYPTOCRINUS, Goldfuss (Agas.), 1834.

E. CÆLATUS, Hall, Palæont. N. York, Vol. 2, p. 210, Pl. 47, fig. 4, a – e. *Hypanthocrinites cœlatus,* Hall, Geol. Rep. 4th District, 1843, p. 113, fig. 1. *Silurian.* Niagara group.

E. DECORUS, Hall, Palæont. N. York, Vol. 2, p. 207, Pl. 47, fig. 1, 2 a – h, 3 a – d. *Hypanthocrinites decorus,* Phillips, Murchison, Sil. Syst., 1839, p. 672, Pl. 17, fig. 3. *H. decorus,* Hall, 1843, Geol. Rep. 4th Dist. N. York, p. 113, fig. 2, 3. Compare *H. cœlatus* ut supra. *Silurian.* Niagara group.

E. PAPULOSUS, Hall, Palæont. N. York, Vol. 2, p. 211, Pl. 47, fig. 5, a, b. *Silurian.* Niagara group.

FORBESIOCRINUS, De Koninck and Lehon, 1854.

F. Agassizi, Hall, Iowa, Vol. 1, p. 630. *Subcarboniferous.*

F. Giddingsii, Hall, Iowa, Vol. 1, p. 633, Pl. 17, fig. 2 – 4. *Subcarboniferous.* Keokuk limestone (?).

F. Meeki, Hall, Iowa, Vol. 1, p. 631, Pl. 17, fig. 3. *Subcarboniferous.* Keokuk limestone.

F. Shumardianus, Hall, Iowa, Vol. 1, p. 671, Pl. 17, fig. 1. *Subcarboniferous.* St. Louis limestone.

F. Whitfieldi, Hall, Iowa, Vol. 1, p. 632. *Subcarboniferous.* Keokuk limestone.

F. Wortheni, Hall, Iowa, Vol. 1, p. 632, Pl. 17, fig. 5. *Subcarboniferous.* Keokuk limestone.

GLYPTOCRINUS, Hall, 1852.

G. decodactylus, Hall, Palæont. N. York, Vol. 1, p. 281, Pl. 77, fig. 1; Pl. 78, fig. 1. *Silurian.* Hudson River group.

G. fimbriatus, Shumard, Geol. Surv. Missouri, Pt. 2, 1855, p. 194, Pl. A, fig. 8, a – c. *Silurian.* Cape Girardeau limestone.

G. plumosus, Hall, Palæont. N. York, Vol. 2, p. 180, Pl. A, 41, fig. 3, a – g. *Actinocrinus plumosus. Silurian.* This species is made out entirely from the fingers and tentacula.

G. ——? Hall, Palæont. N. York, Vol. 2, p. 181, Pl. A, 41, fig. 4. *Silurian.* Clinton group.

GLYPTOCYSTITES, Billings, 1854, Canadian Journ., Vol. 2, p. 215.

G. multiporus, Geol. Survey of Canada, Palæont., Dec. III. p. 54, Pl. 3; Canad. Journ., Vol. 2, p. 215; Rep. 1856, p. 281. *Silurian.* Lower Silurian.

G. Logani, Geol. Surv. Canada, Palæont., Dec. III. p. 59, Pl. 4, fig. 1, a – h. Rep. 1856, p. 282. *Silurian.* Trenton limestone.

G. Logani var. gracilis, l. c. p. 59, Pl. 4, fig. 2. *Silurian.* Trenton limestone.

G. Forbesi, Geol. Survey of Canada, Palæont., Dec. III. p. 59, Pl. 4, fig. 3. *Silurian.* Chazy limestone.

GLYPTORASTER, Hall, 1852.

G. brachiatus, Hall, Palæont. N. York, Vol. 2, p. 187, Pl. 41, fig. 3, a, b. *Silurian.* Niagara group.

GONIASTER, Agassiz, 1834.

G. sp. indet., Graham, Anthony, and James, Sill. Journ., 2d Series, Vol. 1, p. 441. *Silurian.* Cincinnati, Ohio.

GRAPHIOCRINUS, De Koninck and Lehon, 1854.

G. 14-BRACHIALIS, Lyon, Geol. Survey of Kentucky, Vol. III, p. 477, Pl. 1, fig. 1, 2 a, b. *Subcarboniferous.* Near base of Millstone Grit, Crittenden Co., Kentucky.

HEMICYSTITES, Hall, 1852.

H. PARASITICA, Hall, Palæont. N. York, Vol. 2, p. 246, Pl. 51, fig. 18, 19, 20, 20′. *Silurian.* Niagara group.

HETEROCYSTITES, Hall, 1852.

H. ARMATUS, Hall, Palæont. N. York, Vol. 2, p. 229, Pl. 49, A, fig. 3, a – c. *Silurian.* Niagara group.

HETEROCRINUS, Hall, 1847.

H. (?) GRACILIS, Hall, Palæont. N. York, Vol. 1, p. 280, Pl. 76, fig. 3, a, b. *Silurian.* Hudson River group.

H. HETERODACTYLUS, Hall, Palæont. N. York, Vol. 1, p. 279, Pl. 76, fig. 1, a – o. *Silurian.* Hudson River group.

H. SIMPLEX, Hall, Palæont. N. York, Vol. 1, p. 280, Pl. 76, fig. 2, a – d. *Silurian.* Hudson River group.

HOMOCRINUS, Hall, 1852.

H. CYLINDRICUS, Hall, Palæont. N. York, Vol. 2, p. 186, Pl. 41, fig. 2, a – c, 3, a – c. *Silurian.* Niagara group.

H. PARVUS, Hall, Palæont. New York, Vol. 2, p. 185, Pl. 41, fig. 1, a – f. *Silurian.* Niagara group.

H. POLYDACTYLUS, Shumard, Trans. Acad. St. Louis, Vol. 1, No. 1, p. 78, Pl. 1, fig. 6, a, b. *Cyathocrinites,* Chrysty's Letters, Pl. 1, fig. 7, Pl. 3, fig. 1. *Silurian.* Hudson River group, Richmond, Indiana.

ICHTHYOCRINUS, Conrad, Journ. Acad. Nat. Sci. Philad., Vol. 8, p. 279.

I. BURLINGTONENSIS, Hall, Iowa, Vol. 2, p. 557, with diagram. *Subcarboniferous.* Burlington limestone.

I. (?) CLINTONENSIS, Hall, Palæont. New York, Vol. 2, p. 181, Pl. A, 41, fig. 5. *Silurian.* This species is predicated upon fragments of the arms alone.

I. LÆVIS, Conrad, Journ. Acad. Nat. Sci. Philad., Vol. 8, p. 279, Pl. 15, fig. 16. *I. lævis,* Hall, Palæont. N. York, Vol. 2, p. 196, Pl. 43, fig. 2, a – h. *Silurian.* Niagara group.

I. TIARÆFORMIS, Hall, Iowa, Vol. 1, p. 558, with diagram. *Subcarboniferous.* White's Creek, Tennessee.

LECANOCRINUS, Hall, 1852.

L. CALICULUS, Hall, Palæont. N. York, Vol. 2, p. 203, Pl. 46, fig. 3, a, b. *Silurian.* Niagara group.

L. MACROPETALUS, Hall, Palæont. N. York, Vol. 2, p. 199, Pl. 45, fig. 1, a – h. *Silurian.* Niagara group.

L. ORNATUS, Hall, Palæont. N. York, Vol. 2, p. 201, Pl. 44, fig. 2, a – m. *Silurian.* Niagara group.

L. SIMPLEX, Hall, Palæont. N. York, Vol. 2, p. 202, Pl. 46, fig. 2, a – e. *Silurian.* Niagara group.

LEPOCRINITES, Mather, 1830.

L. GEBHARDI, Mather, Geol. N. York, p. 347. *Silurian.* Pentamerus limestone.

LYRIOCRINUS, Hall, 1852.

L. DACTYLUS, Hall, Palæont. N. York, Vol. 2, p. 197, Pl. 44, fig. 1, a – g. *Marsupiocrinites dactylus,* Hall, Geol. Rep. 4th Dist., p. 114, fig. 4, p. 113, 1843. *Silurian.* Niagara group.

MACROSTYLOCRINUS, Hall, 1852.

M. ORNATUS, Hall, Palæont. N. York, Vol. 2, p. 204, Pl. 46, fig. 4, a – g. *Silurian.* Niagara group.

MALOCYSTITES, Billings, 1858.

M. BAWANDI, Billings, Geol. Survey of Canada, Palæont., Dec. III. p. 66, Pl. 7, fig. 1, a – i. *Silurian.* Chazy limestone.

M. MURCHISONI, Billings, l. c. p. 67, Pl. 7, fig. 2, a – c. *Silurian.* Chazy limestone.

MARSUPIOCRINITES. *Vide* Lyriocrinus.

MEGISTOCRINUS, Owen and Shumard, 1852. Hall, Iowa, Vol. 2, p. 479, makes it a subgenus of Actinocrinus. We doubt if it is a subcarboniferous fossil.

M. EVANSI, Owen and Shumard, Journ. Acad. Nat. Sci. Philad., Vol. 2, Part 1, p. 68 ; Geol. Survey of Wisconsin, Iowa, and Minnesota, 1852, p. 594, Pl. 5 A, fig. 3, a, b. *Subcarboniferous* (?).

M. LATUS, Hall, Iowa, Vol. 1, p. 480, Pl. 1, fig. 1, a, b. *Devonian.* Hamilton group.

MELOCRINITES, Goldfuss (Agas.), 1834.

M. SCULPTUS, Hall, Palæont. N. York, Vol. 2, p. 228, Pl. 49 A, fig. 2, a – d. *Silurian.* Niagara group.

MELONITES, Owen and Norwood, 1846.

M. MULTIPORA, Owen and Norwood, Sill. Journ., 2d Series, Vol. 11, p. 225, with figure. Remarks on same, Engelmann in Vol. 3, p. 124. *Subcarboniferous.* St. Louis Limestone. This fossil has since been restored to *Palæchinus multipora.*

MYELODACTYLUS, Hall, 1852.

M. BRACHIATUS, Hall, Palæont. N. York, Vol. 2, p. 232, Pl. 45, fig. 7, a – e. *Silurian.* Fragments of arms.

M. CONVOLUTUS, Hall, Palæont. N. York, Vol. 2, p. 192, Pl. 42, fig. 5 a, b, 6 a – h. *Silurian.* Niagara group.

NUCLEOCRINUS, Conrad, 1842. OLIVANITES, Troost's List in Proceed. Amer. Assoc. 1849. ELÆACRINUS, Roemer, 1852.

N. ELEGANS, Conrad, Journ. Acad. Nat. Sci. Philad., Vol. 8, Part 2, p. 235. *Devonian.* Hamilton group.

N. HALLI, Conrad, Geol. 3d Dist. New York, p. 163. *Devonian.* Hamilton group.

N. VERNEUILI, Troost, List and Proceedings. *Pentremites Verneuili,* 6th Rep. Tennessee, 1841. Beadle (D'Orb.), Prodrom. 1, p. 102. *Elæacrinus Verneuili,* Rœmer, Monograph, Blastoid. 1852, p. 59, Pl. 5, fig. 1, a – e. *Olivanites Verneuili,* Lyon, Geol. Survey of Kentucky, Vol. 3, p. 490. *Devonian.* Falls of the Ohio; Beargrass Creek.

N. ANGULARIS, Lyon, Geol. Survey of Kentucky, Vol. 3, p. 492, Pl. 5, fig. 2, a, b. *Devonian.* Beargrass Creek.

PALÆASTER, Hall, 1852.

P. NIAGARENSIS, Hall, Palæont. N. York, Vol. 2, p. 247, Pl. 51, fig. 21, 22, 23. *Silurian.* Niagara group.

PALÆOCIDARIS. *Vide* Archeocidaris.

PALÆOCYSTITES, Billings, 1858, Geol. Survey of Canada, Palæont., Dec. III. p. 68.

P. CHAPMANI, Billings, Geol. Survey of Canada, Palæont., Dec. III. p. 71. *Silurian.* Lower Silurian rocks of the age of the Trenton and Chazy limestones and Hudson River group.

P. DAWSONI, Billings, Geol. Survey of Canada, Palæont., Dec. III. p. 70. *Silurian.* Chazy limestone.

P. TENUIRADIATUS, Billings, Geol. Survey of Canada, l. c. p. 69. *Actinocrinus tenuiradiatus,* Hall, Palæont. N. York, Vol. 1, p. 18, Pl. 4, fig. 8, 9. *Silurian.* Chazy limestone.

PALASTERINA, McCoy, 1851, British Foss., p. 59.

P. STELLATA, Billings, Geol. Survey of Canada, Palæont., Dec. III. p. 76, Pl. 9, fig. 1, a, 15. Geol. Rep. 1856, p. 290. *Silurian.* Trenton limestone.

P. RUGOSA, Billings, l. c. p. 77, Pl. 9, fig. 2, a – e. Geol. Rep. 1856, p. 291. *Silurian.* Hudson River group.

PENTREMITES, Say, 1820. PENTATREMITITES, Bronn, Index, and European authors generally.

P. BIPYRAMIDALIS, Hall, Iowa, Vol. 1, p. 607, Pl. 15, fig. 2. *Subcarboniferous.* Keokuk limestone.

P. CERVINUS, Hall, Iowa, Vol. 1, p. 690, Pl. 25, fig. 11, a, b. *Subcarboniferous.* Kaskaskia limestone.

P. CHEROKEUS, Hall, Iowa, Vol. 1, p. 691, Pl. 25, fig. 12, a, b; *P. Cherokeus,* Troost, MSS. and Cat. *P. sulcatus,* Rœmer, Monograph. *Subcarboniferous.* Kaskaskia limestone.

P. CONOIDEUS, Hall, Trans. Albany Inst., Vol. 4; Hall, Iowa, Vol. 1, p. 655, Pl. 22, fig. 8, 9, 10. *Subcarboniferous.* Warsaw limestone.

P. CURTUS, Shumard, 1855, Geol. Survey of Missouri, Part 2, p. 187, Pl. B, fig. 3, a, b. *Subcarboniferous.* Archimedes limestone.

P. DECUSSATUS, Shumard, Trans. Acad. St. Louis, 1858, Vol. 1, No. 2, p. 242, Pl. 9, fig. 6, a, b. *Subcarboniferous.* Button-Mould Knob.

P. ELONGATUS, Shumard, 1855, Geol. Survey of Missouri, 2d Rep. Part 2, p. 187, Pl. B, fig. 4. *Subcarboniferous.* Encrinital limestone.

P. FLOREALIS, Say, Journ. Acad. Nat. Sci. Philad., Vol. 4, No. 9; Sowerby, Zoöl. Journ., Vol. 2, p. 311, Pl. 2, fig. 2. *Subcarboniferous.* See P. Godoni.

P. GLOBOSUS, Troost, MSS.; Hall, Iowa, Vol. 1, p. 695, Pl. 25, fig. 17. *Subcarboniferous.* Kaskaskia limestone.

P. GODONI. *Kentucky Asterial fossil,* Parkinson, 1808, Org. Rem., Vol. 2, p. 235, Pl. 13, fig. 36, 37. *Encrina Godoni,* De France, 1818, Dict. Sci. Nat., Tom. 14. *Encrinites florealis,* Schlotheim, 1820, Pet. Got. *Pentremites florealis,* Say, 1822, Sow. Zoöl. Journ., Vol. 2, p. 311, Pl. 11, fig. 2; Troost, Tr. Geol. Soc. Pennsylvania, Vol. 1, p. 224, Pl. 10, fig. 8.

Pentatremitites florealis, Rœmer, 1852, Monogr. Blast., p. 33, Taf. 1, fig. 1 – 4; Taf. 2, fig. 8. *P. Godoni*, Hall, Iowa, Vol. 1, p. 692, Pl. 25, fig. 13, a, b. *Subcarboniferous.* Kaskaskia limestone; Chester, Illinois; Mt. Sano, Alabama, &c.

P. GROSVENORI, Shumard, Trans. Acad. St. Louis, Vol. 2, No. 2, 1858, p. 240, Pl. 9, fig. 2, a – d. *Subcarboniferous.* Archimedes limestone.

P. GRANULATUS, Rœmer, 1852, Monogr. Blast., p. 43, Taf. 3, fig. 13. *Granatocrinus cidariformis*, Troost, 1849, List and Proceed., p. 62. *Subcarboniferous.* Allen Co., Kentucky.

P. (CODASTER?) KENTUCKIENSIS, Shumard, Trans. Acad. Sci. St. Louis, Vol. 2, No. 2, p. 239, Pl. 9, fig. 5. *Subcarboniferous.* Encrinital limestone.

P. KONINCKIANA, Hall, Trans. Albany Inst., Vol. 4, 1856; Hall, Iowa, Vol. 1, p. 656, Pl. 22, fig. 11, a – c. *Subcarboniferous.* Archimedes limestone.

P. LANTERNIFORMIS, Owen and Shumard, 1850, Jour. Acad. Nat. Sci. Philad., Vol. 2, p. 66, Pl. 7, fig. 15. *P. obliquatus*, Rœmer, 1852, Monogr. Blast., p. 47, Taf. 3, fig. 11, a, b; Owen and Shumard, Geol. Survey of Iowa, Wisconsin, and Minnesota, p. 592, Pl. 5 A, fig. 15. *Subcarboniferous.* Archimedes limestone.

P. LINEATUS, Shumard, Trans. Acad. Nat. Sci. St. Louis, Vol. 2, No. 2, p. 241, Pl. 9, fig. 3, a, b. *Subcarboniferous.* Encrinital limestone.

P. MELO, Owen and Shumard, 1850, Journ. Acad. Nat. Sci. Philad., New Series, Vol. 2, p. 65, Pl. 7, fig. 14, a – c. *Subcarboniferous.* Encrinital limestone.

P. NORWOODI, Owen and Shumard, l. c. p. 64, Pl. 7, fig. 13, a – c. *Subcarboniferous.* Encrinital limestone.

P. OVALIS, Say, Sill. Journ. 1st Series, Vol. 2, p. 36 (non Rœmer). *Silurian.* Lockport, New York.

P. OBESUS, Lyon, 1857, Geol. Survey of Kentucky, Vol. 3, p. 469, Pl. 2, fig. 1, a – d; Hall, Iowa, Vol. 1, p. 695, Pl. 25, fig. 15. *Subcarboniferous.* Iowa, Illinois, and Kentucky.

P. PYRIFORMIS, Say, 1822, Journ. Acad. Nat. Sci. Philad., Vol. 4, p. 294; Troost, Trans. Geol. Soc. Penn., Vol. 1, p. 288, Pl. 10; Sowerby, Zoöl. Journ., Vol. 2, p. 315; Rœmer, Monogr.

Blast., p. 84, Taf. 2, fig. 9, a – c; Hall, Iowa, Vol. 1, p. 693, Pl. 25, fig. 16. *Pentremites, n. sp.*, D. D. Owen, Sill. Journ., Vol. 43, 1824, p. 20, fig. 3. *Subcarboniferous.* Kaskaskia limestone, Iowa.

P. Rœmeri, Shumard, 1855, 2d Rep. Geol. Missouri, Part 2, p. 186, Pl. B, fig. 2, a – d. *Devonian.* Chemung group.

P. Reinwardtii, Troost, Trans. Geol. Soc. Penn., Vol. 1, p. 224, Pl. X. *Pentatremitites Reinwardtii*, Rœmer, 1852, Monogr. Blast., p. 52, Pl. 3, fig. 13, a – c. F. Rœmer, Leonhard and Bronn, Jahrb., 1848, p. 296. *Silurian.* Lower Helderberg group.

P. Sayi, Shumard, 1855, 2d Rep. Geol. Survey of Missouri, Part 2, p. 185, Pl. B, fig. 1, a – d. *Subcarboniferous.* Encrinital limestone.

P. stelliformis, Owen and Shumard, 1850, Journ. Acad. Nat. Sci. Philad., New Series, Vol. 2, p. 67, Pl. 7, fig. 16, a, b; Geol. Survey of Wisconsin, Iowa, and Minnesota, p. 593, Pl. 5 A, fig. 16, a, b. *Subcarboniferous.* Encrinital limestone.

P. subtruncatus, Hall, Iowa, Vol. 1, p. 485, Pl. 1, fig. 3. *Devonian.* Hamilton group.

P. sulcatus, Rœmer, 1852. *Pentatremitites sulcatus*, Monogr. Blast., p. 34, Taf. 3, fig. 10, a – c. *Subcarboniferous.* Archimedes limestone.

P. symmetricus, Hall, Iowa, Vol. 1, p. 694, Pl. 25, fig. 14. *Subcarboniferous.* Kaskaskia limestone.

P. truncata, Conrad, Proceed. Acad. Nat. Sci. Philad., Vol. 1, p. 334. *Subcarboniferous.*

P. Verneuili. See *Ducleocrinus Verneuili.*

P. Wortheni, Hall, Iowa, Vol. 1, p. 606, Pl. 15, fig. 1. *Subcarboniferous.* Keokuk limestone.

PETRASTER, Billings, 1858, Geol. Survey of Canada, Palæont., Dec. III. p. 79. *Silurian.* Trenton limestone.

P. rigidus, Billings, l. c. p. 80, Pl. 10, fig. 3. *Palasterina rigidus*, Geol. Rep. 1856, p. 291. *Silurian.* Trenton limestone.

PLATYCRINUS, Miller, 1821.

P. Americanus, Owen and Shumard, Journ. Acad. Nat. Sci. Philad., 2d Series, 1851, p. 89, Pl. 11, fig. 1, a, b; Geol. Survey of Wisconsin, Iowa, and Minnesota, p. 594, Pl. 5 B, fig. 1, a, b. *Subcarboniferous.* Burlington limestone.

P. Burlingtonensis, Owen and Shumard, l. c. Geol. Survey of Wisconsin, Iowa, and Minnesota, p. 589, Pl. 5 A, fig. 5. *Subcarboniferous.* Burlington limestone.

P. caniculatus, Hall, Iowa, Vol. 1, p. 539. *Subcarboniferous.* Burlington limestone.

P. cavus, Hall, Iowa, Vol. 1, p. 527, Pl. 8, fig. 1, a, b. Compare *P. corrugatus*, Owen and Shumard, Geol. Survey of Iowa, Wisconsin, and Minnesota, p. 589, Pl. 5 A, fig. 2, a – d. *Subcarboniferous.* Burlington limestone.

P. corrugatus, Owen and Shumard, l. c. See *P. cavus*. *Subcarboniferous.* Burlington limestone.

P. discoideus, Owen and Shumard, Journ. Acad. Nat. Sci. Philad., New Series, Vol. 2; Geol. Survey of Wisconsin, Iowa, and Minnesota, p. 581, Pl. 5 A, fig. 1; Hall, Iowa, Vol. 1, p. 535, Pl. 8, fig. 8, a, b. *Subcarboniferous.* Burlington limestone.

P. exsertus, Hall, Iowa, Vol. 1, p. 539. *Subcarboniferous.* Burlington limestone.

P. nodobrachiatus, Hall, l. c. p. 542, diagram. *Subcarboniferous.* This may be the young of some known species.

P. nodulosus, Hall, l. c. p. 541. *Subcarboniferous.* Burlington limestone.

P. nucleiformis, Hall, Iowa, Vol. 1, p. 540, diagram. *Subcarboniferous.* Burlington limestone.

P. pileiformis, Hall, Iowa, Vol. 1, p. 529, Pl. 8, fig. 3, a, b. *Subcarboniferous.* Burlington limestone.

P. planus, Owen and Shumard, Journ. Acad. Nat. Sci. Philad., New Series, Vol. 2, 1851; Geol. Survey of Wisconsin, Iowa, and Minnesota, p. 587, Pl. 5 A, fig. 4; Hall, Iowa, Vol. 1, p. 533, Pl. 8, fig. 6, a, b. *Subcarboniferous.* Burlington limestone.

P. pœcilliformis, Hall, Iowa, Vol. 1, p. 528, Pl. 8, fig. 2, a, b. *Subcarboniferous.* Burlington limestone.

P. Saffordi, Troost, MSS.; Hall, Iowa, Vol. 1, p. 634, Pl. 18, fig. 5, 6. *Subcarboniferous.* Keokuk limestone.

P. Saræ, Hall, Iowa, Vol. 1, p. 673, Pl. 17, fig. 4. *Subcarboniferous.* Keokuk limestone.

P. sculptus, Hall, Iowa, Vol. 1, p. 536, Pl. 8, fig. 2. *Subcarboniferous.* Burlington limestone.

P. SHUMARDIANUS, Hall, Iowa, Vol. 1, p. 532, Pl. 8, fig. 5. *Subcarboniferous.* Burlington limestone.

P. SUBSPINOSUS, Hall, Iowa, Vol. 1, p. 536, Pl. 8, fig. 9, 10. *Subcarboniferous.* Burlington limestone.

P. TUBEROSUS, Hall, Iowa, Vol. 1, p. 534, Pl. 8, fig. 7, a, b. *Subcarboniferous.* Burlington limestone.

P. TRUNCATULUS, Hall, Iowa, Vol. 1, p. 538, Diagram. *Subcarboniferous.* Burlington limestone.

P. TRUNCATUS, Hall, Iowa, Vol. 1, p. 537, Diagram. *Subcarboniferous.* Burlington limestone.

P. WORTHENI, Hall, Iowa, Vol. 1, p. 530, Pl. 8, fig. 4. *Subcarboniferous.* Burlington limestone.

P. YANDELLI, Owen and Shumard, Journ. Acad. Nat. Sci. Philad.; Geol. Survey of Wisconsin, Iowa, and Minnesota, p. 587, Pl. 5 A, fig. 6, a, b. *Subcarboniferous.* Burlington, Iowa.

PLEUROCYSTITES, Billings, 1854, Canad. Journ., Vol. 2, p. 250; Survey Rep. 1857, p. 284. *Silurian.* Lower Silurian.

P. ANTICOSTIENSIS, Billings, Geol. Survey of Canada, Palæont., Dec. III. p. 52, Pl. 1, fig. 3. *Silurian.* Hudson River group.

P. ELEGANS, Billings, Geol. Survey of Canada, Palæont., Dec. III. p. 51, Pl. 2, fig. 2, a – d. *Silurian.* Trenton limestone.

P. EXORNATUS, Billings, Geol. Survey of Canada, Palæont., Dec. III. p. 52. *Silurian.* Trenton limestone.

P. FILITEXTUS, Billings, Geol. Survey of Canada, Palæont., Dec. III. p. 50, Pl. 2, fig. 1, a, b. *Silurian.* Trenton limestone.

P. ROBUSTUS, Billings, Geol. Survey of Canada, Palæont., Dec. III. p. 49, Pl. 1, fig. 2, a. *Silurian.* Trenton limestone.

P. SQUAMOSUS, Billings, Geol. Survey of Canada, Palæont., Dec. III. p. 49, Pl. 1, fig. 1, a – d. *Silurian.* Trenton limestone.

POTERIOCRINUS, Miller, 1821.

P. ALTERNATUS, Hall, Palæont. N. York, Vol. 1, 1847, p. 83, Pl. 28, fig. 1, a – f. *Silurian.* Trenton limestone.

P. CALYCULUS, Hall, Iowa, Vol. 1, p. 553, Pl. 9, fig. 6, a, c. *Subcarboniferous.* Burlington limestone.

P. GRACILIS, Hall, Palæont. N. York, Vol. 1, 1847, p. 84, Pl. 28, fig. 2, a – f. *Silurian.* Trenton limestone.

P. HEMISPHÆRICUS, Shumard, Trans. Acad. Sci. St. Louis, Vol. 1, No. 2, 1858, p. 221. Coal measures.

P. LONGIDACTYLUS, Shumard (non Austin, Crin., Pl. 11. Vide *P. Missouriensis. Subcarboniferous.* St. Louis limestone.

P. MEEKIANUS, Shumard, Geological Survey of Missouri, Part 2, p. 188, Pl. A, fig. 7, a, b. *Subcarboniferous.* Encrinital limestone (?).

P. MISSOURIENSIS, Shumard, Trans. Acad. St. Louis, 1857, Vol. 1, No. 1, p. 80. *P. longidactylus*, Geol. Survey of Missouri, p. 188, Pl. B, fig. 5, a – c. *Subcarboniferous.* Shumard proposes *P. Missouriensis* instead of *P. longidactylus* (Austin), which he had unwittingly appropriated.

P. OCCIDENTALIS, Owen and Shumard, Journ. Acad. Nat. Sci. Philad., Vol. 2, 2d Series, 1851 ; Geol. Survey of Wisconsin, Iowa, and Minnesota, p. 596, Pl. 5 B, fig. 5, a, b. *Subcarboniferous.* Kaskaskia limestone.

P. RHOMBIFERUS, Owen and Shumard, Journ. Acad. Nat. Sci. Philad., 1851 ; Geol. Survey of Wisconsin, Iowa, and Minnesota, p. 595, Pl. 5 B, fig. 2, a – c. *Subcarboniferous.* Burlington limestone.

P. RUGOSUS, Shumard, Trans. Acad. Sci. St. Louis, Vol. 1, No. 2, p. 223. *Subcarboniferous.* Coal measures.

P. SPINOSUS, Owen and Shumard, Journ. Acad. Nat. Sci. Philad., 2d Series, Vol. 2, 1851 ; Geol. Survey of Wisconsin, Iowa, and Minnesota, p. 596, Pl. 5 B, fig. 4. *Subcarboniferous.* Chester, Illinois, in Kaskaskia limestone ; Greyson Co., Kentucky.

P. TUMIDUS, Owen and Shumard, Journ. Acad. Nat. Sci., 2d Series, Vol. 2, 1851 ; Geol. Survey of Wisconsin, Iowa, and Minnesota, p. 595, Pl. 5 B, fig. 3, a, b. *Subcarboniferous.* Kaskaskia limestone.

PTEROTOCRINUS, Lyon and Casseday, 1859.*

P. CAPITALIS. *Asterocrinus capitalis*, Lyon, Geological Survey of

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* The name *Asterocrinus* was given to a new genus of fossil crinoids described by Lyon. As this name had already been appropriated by Münster, we deem it necessary to change the generic appellation to *Pterotocrinus.* We have, in manuscript, descriptions of several new species of this peculiar genus of Crinoidea.

Kentucky, Vol. 3, p. 472, Pl. 3, fig. 1, a–k. *Subcarboniferous.*

P. CORONARIUS. *A. coronarius*, Lyon, l. c. p. 476, Pl. 1, fig. 1, 1 a. *Subcarboniferous.*

PYGORYNCHUS, Agassiz, 1839.

P. GOULDI, Bouvé, Proc. Bost. Soc. Nat. Hist., Dec., 1846, p. 192. Its position (Millstone Grit) as given by M. Bouvé is, we think, exceedingly doubtful.

RHODOCRINUS, Miller, 1821.

R. WORTHENI, Hall, Iowa, Vol. 1, p. 556, Pl. 9, fig. 8, a – c. *Subcarboniferous.* Burlington limestone.

SACCOCRINUS, Hall, 1852.

S. SPECIOSUS, Hall, Palæont. N. York, Vol. 2, p. 205, Pl. 46, fig. 1, a – n, fig. 2. *Silurian.* Niagara group.

SCAPHIOCRINUS, Hall, 1858, Iowa, Vol. 1, p. 549.

S. DACTYLIFORMIS, Hall, Iowa, Vol. 1, p. 670, Pl. 17, fig. 6. *Subcarboniferous.* St. Louis limestone.

S. DECABRACHIATUS, Hall, Iowa, Vol. 1, p. 679, Pl. 25, fig. 1. *Subcarboniferous.* Kaskaskia limestone.

S. DICHOTOMUS, Hall, Iowa, Vol. 1, p. 553, diagram. *Subcarboniferous.* Burlington limestone.

S. INTERNODIUS, Hall, Iowa, Vol. 1, p. 679, Pl. 25, fig. 2. *Subcarboniferous.* Kaskaskia limestone.

S. SCOPARIUS, Hall, Iowa, Vol. 1, p. 680, Pl. 25, fig. 3, a, b. *Subcarboniferous.* Kaskaskia limestone.

S. SIMPLEX, Hall, Iowa, Vol. 1, p. 551, Pl. 9, fig. 10. *Subcarboniferous.* Burlington limestone.

SCHIZOCRINUS, Hall, 1847.

S. NODOSUS, Hall, Palæont. N. York, Vol. 1, p. 81, Pl. 27, fig. 1, a – h; Foster and Whitney, Lake Superior, p. 208, Pl. 25, fig. 2, a – c. *Silurian.* Trenton limestone.

S. STRIATUS, Hall, Palæont. N. York, Vol. 1, p. 316, Pl. 28, fig. 4, a – c. *Silurian.* Trenton limestone.

S. sp. indet., Hall, l. c. p. 86, Pl. 29, fig. 1. *Silurian.* Trenton limestone.

SCHYPHOCRINUS, Hall, 1847.

S. HETEROCOSTALIS, Hall, Palæont. N. York, Vol. 1, p. 85, Pl. 28, fig. 3, a – f. *Silurian.* Trenton limestone.

STENASTER, Billings, 1858. *Silurian.* Lower Silurian.

S. PULCHELLUS, Billings, Geol. Survey of Canada, Palæont., Dec. III. p. 79, Pl. 10, fig. 2. *Silurian.* Trenton limestone.

S. SALTERI, Billings, l. c. p. 78, Pl. 10, fig. 1, a, b. *Silurian.* Trenton limestone.

STEPHANOCRINUS, Conrad, 1842.

S. ANGULATUS, Conrad, Journ. Acad. Nat. Sci. Philad., Vol. 8, p. 279, Pl. 15, fig. 18; Hall, Palæont. N. York, Vol. 2, p. 212, Pl. 48, fig. 1, a – m. *Silurian.* Niagara shale, Lockport.

S. GEMMÆFORMIS, Hall, l. c. fig. 2, a – i. *Silurian.* Niagara group.

SYNBATHOCRINUS, Phillips, 1836.

S. DENTATUS, Owen and Shumard, Journ. Acad. Nat. Sci. Philad., Vol. 2, 2d Series; Idem, Geol. Survey of Wisconsin, Iowa, and Minnesota, p. 597, Pl. 5 B, fig. 7, a, b. *Subcarboniferous.* Burlington limestone.

S. MATUTINUS, Hall, Iowa, Vol. 1, p. 483, Pl. 1, fig. 2. *Devonian* Hamilton group.

S. SWALLOVI, Hall, Iowa, Vol. 1, p. 672, Pl. 17, fig. 89. *Subcarboniferous.* St. Louis limestone.

S. WORTHENI, Hall, Iowa, Vol. 1, p. 560, Pl. 9, fig. 9. *Subcarboniferous.* Burlington limestone.

SAXOCRINUS, Phillips, 1836.

S. INTERSCAPULARIS, Hall, Iowa, Vol. 1, p. 482, Pl. 1, fig. 3. *Devonian.* Hamilton group.

TÆNICASTER, Billings, 1858.

T. CYLINDRICUS, Billings, Geol. Survey of Canada, Palæont., Dec. III. p. 81, Pl. 10, fig. 4, a, b. *Silurian.* Trenton limestone.

T. SPINOSUS, Billings, l. c. Pl. 10, fig. 3, a – d. *Palæocoma spinosa,* Billings, Geol. Survey of Canada, Rep. 1856, p. 292. *Silurian.* Trenton limestone.

THYSANOCRINUS, Hall, 1852.

T. ACULEATUS, Hall, Palæont. N. York, Vol. 2, p. 190, Pl. 42, fig. 3, a – d. *Silurian.* Niagara group.

T. CANALICULATUS, Hall, Palæont. N. York, Vol. 2, p. 189, Pl. 42, fig. 2, a – d. *Silurian.* Niagara group.

T. IMMATURUS, Hall, Palæont. N. York, Vol. 2, p. 191, Pl. 42, fig. 4, a – f. *Silurian.* Niagara group.

T. LILIIFORMIS, Hall, l. c. fig. 1, a – f. *Silurian.* Niagara group.

VASOCRINUS, Lyon, 1857.

V. SCULPTUS, Lyon, Geol. Survey of Kentucky, Vol. 3, p. 486, Pl. 4, fig. 3, b – e. *Devonian.* Beargrass Creek, Kentucky.

V. VALENS, Lyon, l. c. fig. 3, 3 a. *Devonian.* Beargrass Creek, Kentucky.

ZEACRINUS, Troost, MSS. (Hall).*

Z. DEPRESSUS, Troost, MSS.; Hall, Iowa, Vol. 2, p. 546. *Subcarboniferous.*

Z. ELEGANS, Hall, Iowa, Vol. 1, p. 547, Pl. 9, fig. 12. *Subcarboniferous.*

Z. INTERMEDIUS, Hall, Iowa, Vol. 1, p. 681, Pl. 25, fig. 4. *Subcarboniferous.* Kaskaskia limestone.

Z. MAGNOLIÆFORMIS, Troost, MSS.; Hall, l. c. pp. 684, 545, 544. *Subcarboniferous.* Pentremital limestone, Tennessee.

Z. MANIFORMIS, Hall, l. c. p. 682, Pl. 25, fig. 8. *Poteriocrinus maniformis*, Yandell and Shumard, Contrib., p. 24, Pl. 1, fig. 2. *Cyathocrinus maniformis*, Yandell and Shumard, Contributions. *C. gracilis*, Troost, Cat. *Subcarboniferous.* Kaskaskia limestone, Illinois; Archimedes limestone, Kentucky.

Z. RAMOSUS, Hall, Iowa, Vol. 1, p. 548, Pl. 9, fig. 3. *Subcarboniferous.* Burlington limestone.

Z. WORTHENI, Hall, Iowa, Vol. 1, pp. 545, 683, with diagram. *Subcarboniferous.* Kaskaskia limestone.

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* "This genus begins its existence, so far as known, in the Burlington limestone, and continues to the Chester limestone, becoming far more abundant and extravagant in its forms in the latter period." — HALL.